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AGRICULTURAL JOURNAL

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So many requests are received from abroad for parts of the *Agricultural Journal* which were never published that the following list of all issues is given for reference. Attention is directed especially to Volume VII which had only one part:—

Vol.			*Vol.*		
I	3 numbers,	1928	VIII	4 numbers,	1935–7
II	4 ,,	1929	IX	4 ,,	1938
III	3 ,,	1930	X	4 ,,	1939
IV	4 ,,	1931	XI	4 ,,	1940
V	2 ,,	1932	XII	4 ,,	1941
VI	2 ,,	1933	XIII	4 ,,	1942
VII	1 number,	1934			

ISSUES OF THE AGRICULTURAL CIRCULAR.

THE following were the numbers and year of issue of the *Circular*:—

Vol. 1, 1920, 12 numbers.	Vol. 4, 1923, 1 number.
,, 2, 1921, 5 ,,	,, 5, 1924–5, 2 numbers.
,, 3, 1922, 4 ,,	

As number 4 of Vol. 3 was printed as "Volume 4" and number 1 of Vol. 4 as "Volume 5" it would appear from an inspection of a complete set that Volume 4 comprised only a number 4 and that there were two issues of Volume 5, Part 1.

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5. Scale Insect on Bananas, 1913.
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—EDITOR.

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ERRATA—Volume 14, No. 1—

Page 1, paragraph 1, last line and page 3, paragraph 5, lines 5 and 6 both these should read " full cargo of two ships of 4,500 tons shipping capacity."

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AGRICULTURAL JOURNAL

ISSUED BY THE

DEPARTMENT OF AGRICULTURE, FIJI.

VOL. 14.] JUNE 1943. [No. 2.

EDITORIAL.

ONLY the advent of Japan into the war generated a true realisation of the Colony's dependence on Imperial foodstuffs and the improvidence of neglecting to maintain agricultural production in a healthy and prosperous state. Recently, after over three and a half years of war we were rudely reminded of our shortcomings when there was a temporary shortage of flour and it is still doubtful if the people as a whole realise to the full the importance of home production of foodstuffs in these critical times.

Cold comfort was administered to us recently by the Information Department when we were advised that the end of the war was still a long way off and that our activities should be based on this knowledge and preparations towards more self-sufficiency made accordingly, especially as regards food supplies.

Despite highly lucrative temporary employment, such as laundry work, in the towns and in the neighbourhood of camps it is still as urgently necessary now as a year ago that all occupiers of land should plant up regularly at least as much food crops and green vegetables as they and their families require. A surplus should be grown for sale in the case of those within reach of a market.

Large quantities of fruit and vegetables continue to be made available to the military, though during the past few months vegetables have been far short of requirements mainly due to climatic reasons.

Shortages have also occured due to growers in the vicinity of camps forsaking food and vegetable production for more profitable occupations and such shortages have inevitable affected the civil population.

Now that the season for European vegetables has arrived town residents with even small gardens are strongly advised to plant up beds of lettuce, cabbage, beans, tomatoes, etc., so as to make themselves at least partly independent of purchased vegetables for the table. It is hoped that this advice may be followed by many people.

In this issue further reference is made to the excellent results achieved by the Nausori Fijian Co-operative Market in the maintenance of supplies of vegetables and fruit to the Military forces throughout the year 1942. The results amply indicate that Fijians can under supervision co-operate effectively to produce and market material quantities of fresh food to their own and the Colony's advantage.

Another article by an Indian Field Assistant describes some of the uses that can be made of locally grown maize, which is our most effective substitute for sharps and flour, and it should be read with interest.

The cultivation of vegetables with a view to maintaining and storing sufficient seed for local requirements is dealt with in a further note. This work is of considerable importance at present when it is not easy to import seed in the quantities required.

In the Chemical Laboratory of the Department the work covers a wide range of subjects and an article by the Director gives some indication of the value of the laboratory to the Colony and will therefore be found more than usually interesting to most readers.

Amongst entomological notes mention may be made of some further observations regarding local mosquitoes as indicating the attention that is now being given to this subject under wartime conditions. An extract from the *Crown Colonist* which appears later in the *Journal* shows how co-operation between our West African medical services and the United States forces is dealing with the malaria problem. A note is given showing how to distinguish mosquitoes from other flies.

Other articles of interest include notes on a cattle tick on man, the control of cockroaches in households, various weevils and local scale insects which have been intercepted in the United States or Hawaii.

Various reviews are included in this issue: Sir Alan Pim in writing of some possible post-war dangers claims that in future both trade and capital investment would be more subject to Government Control after the war also that exchange and commodity control schemes had come to stay but that more attention would be given to the needs of the consumers. He said that the question of land settlement was most important for the agricultural future and that small industries and internal trade should be encouraged. There are also a number of interesting Extracts.

Two reviews indicate the wide scope of the activities embraced by the Colonial Advisory Council of Agriculture and Animal Health and as such should prove of much interest.

In another review special reference is made to that dealing with the relative nutritive values of different forms of milk which is such a vital constituent of the human diet and for which there is still much scope for expansion of production locally.

The importance of milk in human nutrition rests primarily on its content of first class animal protein of high biological value, its exceptional richness in calcium and its valuable contribution of vitamin A, of nitroflavin and other water-soluble vitamins and the review portrays the effects of various treatments on the composition of the milk. It is shown that vitamins A and D, carotene and riboflavin survive the various methods of preservation of milk without appreciable loss.

Another review which will be read with interest by dairy farmers is a synopsis of an article on diseases of animals and their treatment which recently appeared in the Journal of the Royal Agricultural Society of England.

Finally a short review mentions the possibility that malaria may already have reached New Caledonia; presumably the writer has some good reasons for expressing his suspicions that the Anopheline mosquito has recently extended its range to a group of islands which lie some 800 miles west of Fiji.

CHEMICAL SERVICES IN FIJI.

By
H. W. JACK, O.B.E., D.Sc., B.A.,
Director of Agriculture.

THE chemical laboratory of the Department of Agriculture has now completed thirty years of service to the Colony and as the first established chemical laboratory service in Fiji opportunity is taken to describe briefly the history of this division of the Department and the nature of the services rendered.

The Government Chemical Laboratory was first established in 1913 with the appointment of Mr. C. H. Wright, M.A., F.I.C., as Agricultural Chemist. Before that time certain analytical work was performed by Government Pharmacists and Medical Officers of Health but it had been found necessary to submit many samples to laboratories outside the Colony for expert opinion, particularly to the Imperial Institute, London.

Mr. Wright functioned as Agricultural Chemist and Government Analyst until 1924 and during that period chemical work was organised to deal with general analyses for all Government Departments needing such services as well as for research work for the Department of Agriculture. A great deal of attention was directed to the study of the soils, essential oils of local plants, mould damage to copra, fixed oils and other duties associated with officers of the expanding Department of Agriculture.

Mr. Wright acted as Director of Agriculture on two occasions and published several bulletins whilst serving with the local Department of Agriculture. On his transfer to Nigeria as Senior Chemist in 1924 he began a series of classical studies on tropical soils which led to the publication of many scientific papers and two of the finest text-books on soil methods and agricultural chemical methods in the English language.

In 1925 Mr. C. L. Southall, B.Sc., A.I.C., was appointed as Government Chemist and Government Analyst and remained in the Colony until 1928, when he was transferred to Singapore. Under this officer the general analytical duties expanded greatly due in no small measure to the rapidly developing legislation of the Colony affecting foods and drugs. Mr. Southall gave some attention to the copra industry and to local soils and organised the laboratory as it existed until 1930.

The present officer in charge of the laboratory, Mr. W. J. Blackie, M.Sc., F.I.C., F.N.Z.I.C., was appointed in 1930 as Government Chemist and Analyst, and in 1939 was promoted to Senior Chemist of the Colonial Agricultural Service. Under this officer the work of the laboratory, in keeping with the rapid development of the Colony, has increased considerably both in nature and amount. Before the outbreak of the war the staff consisted of two qualified officers, one trained European assistant who has subsequently qualified, and two Native assistants The laboratory has expanded considerably and the equipment valued at £1,000 in 1930 has now a capital value in excess of £3,000.

On the outbreak of war two European officers were required for military and other duties and although these officers have not been replaced the laboratory has managed to maintain essential services and even perform additional duties peculiar to the times. All the long term research schemes have been abandoned for the time being because of lack of staff and in order to conserve chemicals, labour and equipment for essential services.

In the following pages a brief account is presented of the types of work that have been performed in the laboratory during the past ten years and fuller accounts will be found in the annual reports of the Division and articles

published in the *Agricultural Journal*, Fiji, and British and American scientific Journals.

Under the Pure Food Ordinance samples of all types of food are submitted by the Public Health Inspectors for conformance with regulations in regard to quality and the absence of prohibited colouring and flavouring agents and poisonous metals. In general the foods of the Colony conform very closely with the Regulations, the worst offenders being certain lines of canned goods and milk. The introduction of the freezing point test for milk by the present Government Chemist has removed all doubt about our milk being able to conform to temperate country standards and there has been, accordingly, a marked improvement in quality.

Liquors, canned goods and petroleum are examined for the Customs Department for conformance with Regulations and in certain cases, such as the obscuration of liquors, for the assessment of duty. Petroleum products are also examined for the Vacuum Oil Company by arrangement.

A considerable number of analyses and investigations are made for the Police Department in connection with drugs, liquors, poisons and forensic chemistry generally. There has been a marked increase in this work within recent years both in amount and nature. This work is performed in association with the Criminal Investigation Department and the Government Pathologist. As indicative of the nature of this work the following types of investigation are mentioned: human and animal poisoning cases, firearms and ballistics, illicit liquor, drugs, stolen petrol, examination of dusts, stains, fibres, paper and small particles of metal taken in connection with crimes, deposits in barrels of suspected weapons, counterfeit coins, inks, glass spicules, soils and many others. A considerable amount of this work is peculiar to the Colony and in certain cases investigation of methods have been necessary. In 1940 the Government Chemist developed a new method for the detection of the resin constituent of Indian hemp and the value of this method has been confirmed by American investigators.

With the discovery of gold in the Colony and the greatly increased prospecting activities, the Government Chemist was called upon to organize a new service for gold and base metal ore assaying. This work was performed until 1940 when as a result of staff reductions and the falling off in prospecting as a result of the war, this work was discontinued. However, the routine aspect of this work has now been taken over by the Mines Department and therefore this very valuable service will continue to be available to the public. The chemical laboratory was very closely identified with the early development of the gold mining industry, and with prospectors and officials of the larger prospecting companies and played a leading part in the uncovering of certain malpractices.

The Senior Chemist is responsible for certain investigations and routine analyses required by the Department. The routine work includes the analyses of soils, copra samples, fertilizers, derris samples, citrus for maturity tests and the like. The investigations have included soil surveys, mould damage to copra, production of banana figs, studies on candlenut and dilo oils, drying of copra, grading of copra, vitamin C content of local foods and fruits, observation in citrus introductions to Nasinu, the rotenone content of the local derris species, milk investigations, lime requirement of Fiji soils, poison plants of Fiji and methods of soil analysis. Many other investigations of a minor character have also been performed. In 1939 a soil survey of Fiji was commenced but with the advent of war this work was discontinued owing to staff shortages and the necessity to conserve chemicals. Since the time of the first Government Chemist, Mr. C. H. Wright, the

whole new science of pedology has been developed and it is hoped that soils of the Colony will be re-examined and mapped in accordance with new ideas when circumstances permit.

Another important feature of the work of the Government Laboratory is the examination of stores which are suspected to be of faulty manufacture, or have been damaged in transport or are deficient in quality. Cases of this nature which have been successfully examined in the laboratory include faulty telephone cable, galvanised iron goods, tinned goods and certain medical supplies.

Research work on problems of interest to the Colony forms a feature of the normal peace-time activities of the laboratory. Under the present conditions however, of short staffs and the need to conserve chemical supplies and apparatus, work of this nature has been restricted to the investigation of problems of importance to the military.

The war has brought many new problems to the laboratory and also additional work and it is not possible to do more than indicate briefly the nature of this work. In association with the Chemical Warfare Section of the army, standardised methods have been tested and developed for the determination of the war gases in the field and protective paints and decontamination materials have been examined. Captured enemy stores, including smoke bombs, candles containing harassing agents, decontamination materials and protective paints have been examined. Assistance has been given to other units in a variety of subjects including the quality of certain foods, the dulling of military weapons, the examination of water supplies, cigarettes suspected of containing "dope," a document for secret writing, explosives for deterioration, and shell cases suspected of being damaged. Advice has been sought on all types of subjects and many preparations have been made. This work has been much appreciated by those concerned and excellent co-operation has been established.

In conclusion, reference must be made to the advisary duties peculiar to a chemical laboratory. A considerable amount of time is devoted to requests for information from the general public, government and military officers on a variety of topics of a chemical nature and these duties have increased materially in these days of restricted supplies.

With the formation of the Production and Marketing Board the Senior Chemist was appointed a member of the Industries Sub-Committee and in association with the other members of that sub-committee has considered ways and means of establishing certain industries in the Colony. Development along industrial lines is however, rendered difficult by absence of cheap power and machinery, but above all by the lack of suitable labour and technical assistance.

In 1937 the Senior Chemist was awarded a Commonwealth Service Fellowship for post-graduate study in biochemistry with particular reference to nutrition at Yale University, United States of America, and with the consent of the Secretary of State for the Colonies was given leave of absence for a period of 16 months. On his return to the Colony in 1939 a commencement was made on the examination of our foodstuffs for their vitamin and mineral contents but this work which was to be a part of the Nutrition Committee's research programme had to be abandoned as a result of the outbreak of war. The Senior Chemist continues to assist as a member of the Nutrition Committee until such time as opportunity permits the resumption of the Committee's research schemes.

The above notes amply indicate the wide scope of the work undertaken in the Chemical Laboratory of the Department of Agriculture and that its functions are of considerable value to the Colony.

AGRICULTURAL NOTES.

1. A FURTHER NOTE ON THE NAUSORI FIJIAN CO-OPERATIVE MARKET.

By
C. HARVEY, B.Sc., A.I.C.T.A.
Senior Agricultural Officer.

THE market scheme was originated by exempted Fijian farmers in September, 1939, for the disposal of fresh vegetables, fruit and other produce. The building was completed in January 1940, materials being advanced by the Department of Agriculture and the work of erection carried out by members of the scheme. The building was formally opened on 20th January by the Adviser on Native Affairs. (See *Agric. Journal* Vol 11, No. 1, 1940.)

The market started in a comparatively small way supplying vegetables and fruit to institutions and private consumers in Suva. The greatly increased demand for fresh produce that followed the arrival of large numbers of troops in the Colony found the market organization in a position to increase production rapidly, and the turnover has expanded from 290 tons valued at £2,000 for the nine months ending in July 1941, to approximately 1,500 tons valued at nearly £20,000 during the 12 months of 1942, which represents about half the fresh produce supplied to the Military in the Eastern districts. In addition, firewood to the value of £2,500 has been supplied and a large number of private orders for vegetables and fruit.

The management of the organization is in the hands of a committee of Fijians of whom the Chairman is Manasa Tauca of Naila. The handling of produce and the daily accounts are in the hands of Fijian employees. The Department of Agriculture has fostered the market and at the present time particularly, with a greatly expanded turnover, the Agricultural Officer in whose area the market operates maintains close touch with the Committee and supervises their accounts.

There are 206 members of the Market, all of whom are exempted Fijian farmers from the Provinces of Naitasiri, Tailevu, Rewa and Namosi, but the produce of any Fijian grower is accepted and occasionally even Indian and Chinese produce is handled. Originally the scheme provided for a commission of five per cent of the sale of members' produce and ten per cent on that of non-members, but in order to reduce the work of keeping accounts produce is now purchased outright at prices slightly below the contract sale prices. The advance for the purchase of building materials has long since been repaid out of profits, extensions to the building have been made and a useful reserve has been established to meet the difficult times that lie ahead when the demand for fresh produce contracts, as inevitably it must.

The Market has played an important part in the organization of supplies, not only in the purchase and collection of produce from a very large number of small suppliers but also in the provision of means whereby production can be rapidly stimulated, seed distributed and improvements effected in methods of production and marketing. The organization will, it is hoped, prove of equal value in the organization of the marketing of native produce under peacetime conditions.

The Agricultural Officer South (Mr. B. E. V. Parham) has supervised the organization and development of this market since its inception and much credit is due to him for its splendid success.

2. THE IMPORTANCE AND VALUE OF MAIZE FOR HUMAN CONSUMPTION.

By
SAMUEL BHARAT,
Indian Field Assistant.

MAIZE is one of the most extensively used grains in the world and is an excellent food for man as well as domestic animals. In many parts of the world it is used in one or other of the under-mentioned ways—

(*a*) Breakfast cereals, e.g. corn flakes.

(*b*) Corn flour for manufacturing sweets and pastry, thickening of soups and stews, and as a meal for invalids and children, when boiled with milk and sugar.

(*c*) Corn oil is used for cooking and salads.

(*d*) Corn meal as a porridge or gruel or for native bread making.

The climate and soil of Fiji are well suited to the cultivation of maize and large quantities are grown—chiefly as food for domestic animals. In these times when intermittent shortages of rice and sharps occur the importance of maize for human food is greatly increased. Some suggestions for preparing and using maize are:—

(*a*) *Home-made flour.*—The hulls are removed from the dry grains by pounding in the denki (or okhali) the grain being sprinkled lightly with water during the process, and then winnowed. It is then placed in a tin and sufficient hot water to cover all the grain is poured on and allowed to soak overnight. The water is drained off and the grain partly dried by placing on a mat in the sun for half an hour; it is then pounded in the denki and finally passed through a sieve. For best results it is essential to use the flour whilst it is fresh as it will not keep for any length of time. Roti prepared from this flour is somewhat hard and "short" but if mixed with sharps, tapioca, sorghum or wheaten flour, the texture and palatability is greatly improved. Half and half makes a good mixture.

(*b*) *Maize "bhat".*—The larger particles which failed to pass through the sieve in the process mentioned above are boiled and eaten in the same manner as rice.

(*c*) *Satua.*—In India all grains and almost all dhalls are used for making satua but the satua prepared from barley and gram is most prized. Here, in Fiji, it is made from rice, maize, peas, gram, urd, mung and bean. Generally, all of these are not used at the same time, but two or more varieties of grains, such as rice, maize and urd are used. (See Vol. 11, No. 4, Dec. 1940.)

The whole grains (different varieties being kept separate) are immersed in water overnight and then sundried, with the exception of padi which is heated in water till the husk begins to swell and then strained, dried in the shade and milled in a "denki." The various kinds of grains are put in pots containing sand and heated until cooked thoroughly. The pots are allowed to cool and, after sieving to separate the sand the grains are ground between two stones ("janta"), specially made for the purpose. After grinding separately, all the different varieties are thoroughly mixed and at times a condiment known as "jeera" (a spice Cumin dill) is ground and sprinkled on it. Prior to eating, salt or sugar according to taste is added and then cold water is poured over it gradually while the mixture is stirred slowly with a spoon or with the fingers. When it forms into a soft dough it is ready for eating.

(*d*) *Roast Cobs.*—The whole green cobs are roasted in an open fire and eaten.

(*e*) *Boiled Cobs.*—The whole green cobs are boiled in salted water and eaten.

(*f*) *Pop Corn.*—About two cup fulls of clean sharp sand is made very hot in an iron pot and is stirred briskly with a "sasa" whisk. The thoroughly dried and cleaned grain is thrown in, the stirring and heating continued until the popping is completed.

At Suva, Nadi and Ba there are small mills where for a small charge maize can be reduced to a very good, fine "whole grain" flour. This flour is very suitable for mixing with other flours for making either "roti" or yeast bread.

One of the commercial bakers at Sigatoka used up to 25 per cent of this corn flour with his wheaten flour and turned out a most palatable and attractive loaf.

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3. THE PRODUCTION AND STORAGE OF VEGETABLE SEED.

By

C. M. DASS,

Indian Agricultural Instructor.

INTEREST in the local production of vegetable seeds has been stimulated by the wartime difficulties of importation from abroad. While with most English vegetables best results have been obtained from seed imported from temperate countries, seed of certain vegetables produced locally have given quite good results.

At the General Experimental Station, Sigatoka, seed of the following vegetables have been produced in small quantities for a number of years:—

Beans (French, butter, snake, lace, lima and soya).
Garden pea.
Tomatoes (tropical and temperate varieties).
China cabbage (smooth leaf variety).
Lettuce (Mignonette and Webb's Wonderful).
Raddish (white variety).
Gourds (Luffa, snake, bottle, and bitter).
Vegetable marrow.
Pumpkin.
Watermelon.
Rockmelon.
Cucumber.
Okra.
Brinjal (Egg plant).

HOW SEED IS SELECTED.

Healthy plants bearing good average size fruit are selected for seed production. The practice of picking the best plants or fruit for consumption or sale and collecting seed from poor or indifferent plants, or using the tail-end of a crop for seed cannot be too strongly condemned.

WHEN SEED IS HARVESTED.

The seed is allowed to develop and mature thoroughly before it is harvested. Harvesting is done during fine weather to facilitate the drying of the seed.

EXTRACTION OF SEED.

The method of seed extraction varies with different vegetables:—

(1) In the case of beans, peas and okra, and where only small quantities are required, the seed is extracted from the fruit or pods by hand. If large quantities are required the fruit or pods are spread out in the sun on tarpaulins and when quite dry, the seed is beaten out lightly with sticks and winnowed.

(2) With tomatoes and brinjals the fruit is allowed to ripen on the plant, picked and stored until quite soft. It is then crushed by hand in a pail of clean water. The tomato seed floats on the surface and is scooped up by hand, spread out on sheets of brown paper and dried under partial shade. Full exposure to the sun may impair germination. Brinjal seed, however, sinks and is collected after running off pulp and water and then dried in the same way as tomato seed.

(3) With lettuce, China cabbage and radish, the seed is harvested just before full maturity to prevent loss through shattering. The entire seed head is cut, dried in the sun in a spot sheltered from wind, threshed out by rubbing between the hands or beaten out with a light stick, winnowed and again dried.

(4) With pumpkin, watermelon, etc., the fruit is allowed to ripen thoroughly on the plant, the seed extracted by hand and spread out on brown paper in the sun until quite dry.

VIABILITY OF SEED.

No detailed records of the viability of seed are available, but generally it has been found that if carefully stored the seed of most vegetables retains its vitality for a year. Particularly is this the case with temperate zone vegetables. Seed of the cucurbits (pumpkin, watermelon, cucumbers, etc.) and legumes (beans, peas) possess higher longevity than seed of carrots, parsnips or celery. Mignonette lettuce, Indian cauliflower and English cabbage were found to germinate when 18 months old, but the precentage germination was very low. Green Mignonette lettuce of the same age failed to germinate. Garden pea was found to retain its vitality for only one year. French bean may be stored for a longer period than butter bean and fair germination has been obtained in two year old seed of the former.

STORAGE OF SEED.

Seed which is to be stored should be guarded against conditions that favour the development of moulds, viz. moisture and warmth. In the humid warm climate of Fiji, particularly in the wet zone, this is a real problem. Seed should of course also be protected from insect attack.

The best method of storing small quantities of vegetable seed was found to be in lever-top tins or tightly stoppered bottles. The seed has to be thoroughly mature and properly dried before storing. Periodical inspections are made to guard against possible attack of insects or mould. As a precaution against insect attack a little pyrethrum or derris powder is mixed with the seed.

Larger quantities of seed, such as that of soya or French bean, are best stored in lots of about 40 lb either mixed with dry, powdered slaked lime, or the bags stored in an airtight wooden bin and treated with carbon bisulphide once in about two months. If slaked lime is mixed with the seed it should never be stored in paper bags or metal containers. Dry powdered charcoal is an excellent medium in which to store large seeds.

AGE OF SEED.

As is to be expected, fresh seed generally germinates more quickly. The period of germination lengthens and viability decreases as the seed gets older.

The germination period of local and imported vegetables as recorded at Sigatoka are given below:—

	Days.		Days.
Tomato	4 to 7	Leek	3 to 11
Brinjal	6 „ 8	Butter bean	5 „ 7
English cabbage	3 „ 6	French bean	4 „ 7
Cauliflower	3 „ 6	Lace bean	5 „ 16
Kohl rabi	3 „ 5	Lima bean	5 „ 6
China cabbage	2 „ 5	Snake bean	4 „ 5
Silver beet	5 „ 6	Soya bean	3 „ 5
Spinach	5 „ 8	Garden pea	3 „ 5
Lettuce	2 „ 6	Okra	5 „ 6
Parsley	8 „ 11	Chilli	8 „ 11
Radish	3 „ 5	Vegetable marrow	2 „ 8
Carrot	6 „ 7	Cucumber	3 „ 6
Beet	4 „ 5	Watermelon	4 „ 8
Turnip	2 „ 4	Rockmelon	4 „ 8
Parsnip	6 „ 10	Gourds (snake, sponge, bitter, bottle)	4 „ 11
Onion	3 „ 8	Pumpkin	4 „ 7

ENTOMOLOGICAL NOTES.

By

R. J. A. W. LEVER, B.Sc., D.I.C., A.I.C.T.A., F.L.S.
Entomologist.

1. A CATTLE TICK ON MAN.

WHILE on a jungle path at about 3,000 feet on Naqaranabuluti ("Lomalagi") near Nadarivatu the writer took a female tick on his bare knee. This arthropod was kindly identified by the Government Veterinary Officer (Mr. H. T. B. Hall, B.V.Sc.) as *Amblyomma cyprium* Neumann.

In 1910 Jepson (1) recorded it from bush pig and cattle but Robinson (2) shows that a specimen from a cow at "Tavenni" (Taveuni) taken in July 1910 by Jepson was really the then undescribed *A. quasicyprium* Rob. Turbet (3) inferred that there is only one *Amblyomma* in the Colony, viz. *A. cyprium*, recording it from horses as well as pigs and cattle. Actually at least three species are known in Fiji, *A. acutangulatum* Neumann being recorded (2) on a snake from Suva. So far the toad (*Bufo marinus*, L.), a well known host in the West Indies (4), has not yet been found to act thus in Fiji. Incidentally the locality "Island of Veti Leon" (5) for this tick is clearly meant to be Viti Levu, Fiji.

REFERENCES.

(1) Jepson, F. D.—1911. Council Paper No. 25, Department of Agriculture, Fiji, p. 32.
(2) Robinson, L. E.—1926. The Genus *Amblyomma*. Cambridge University Press.
(3) Turbet, C. R.—1924. Annual Report of Veterinary Officer, Department of Agriculture, Fiji.
(4) Lever, R. J. A. W.—1938. *Agric. Jour.*, Fiji, Vol. 9, No. 2, June.
(5) Patton, W. S. & Cragg, F. W.—1913. "A Text Book of Medical Entomology", p. 616.

2. COCKROACHES AND THEIR CONTROL IN HOUSEHOLDS.

Some four years ago the writer drew attention (1) to the possibility of controlling local domestic cockroaches with a fine white powder, sodium silicofluoride or fluosilicate.

This has now been found successful in Suva, Ba and Tavua and amounts up to 1 lb per person are procurable from the Entomologist at a cost of 2s. per lb. This light powder should be thinly dusted behind stoves, ice boxes, refrigerators, under sinks, in cupboards, etc., where exposed food is not kept. Unfortunately the cost has risen from 1s. to 2s. per lb since 1938 but nothing can be done about it: supplies are fairly short.

In houses in Suva the commonest cockroach is the large *Periplaneta americana* L. distinguishable from *P. australasiae* F. by the absence of a yellow ring on the thorax and yellow patch on the outer margin of the tough forewings. At Nadarivatu the most abundant cockroach in the kitchen is *Blatella germanica* L. popularly called the German cockroach owing to its alleged introduction into England along with the Hanoverian dynasty in 1714. Another cockroach which frequents cupboards and bookshelves in Suva is the somewhat fragile tropical cockroach *Supella supellectilium* Serv. One ready means of ingress into houses is the practice of storing empty packing cases among the piles, this accounts for large numbers of *Periplaneta* though as they are powerful fliers many also fly into the houses.

Two local parasites of *Periplaneta* egg capsules are recorded, the large "ensign fly" *Evania impressa* Schlett and the small Chalcid *Tetrastichus hagenowii* (Ratz). which takes 29 to 40 days to mature within the egg.

REFERENCE.

(1) Lever, R. J. A. W. 1938.—*Agric. Jour.*, Fiji, Vol. 9, No. 4, Decbr.

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3. *DIOCALANDRA* AND OTHER WEEVILS IN POLYNESIA.

In this Journal for December, 1941,(1) attention was drawn to the peculiar distribution of *Diocalandra frumenti* F. which though recorded from Papua and Samoa is absent in Fiji lying between though *D. taitensis* occurs there. The matter was referred to Sir Guy Marshall, C.M.G., F.R.S., then Director of the Imperial Institute of Entomology, who replied in March 1942 that the single Samoan record was doubtful and that it was probably a local western race of *taitensis*.

This therefore necessitates a revision of Marshall's paper (2) which records a solitary male *frumenti* from Tutuila, E. Samoa taken in September, 1923, and includes it in the table of distribution among the various islands.

Since the present writer's article was published he has seen from Zimmerman's paper (3) that *D. taitensis* was first recorded in Hawaii in 1919, not 1921 as given.(1)

In a note on *Pachymerus gonager* F. associated with tamarind seeds (5), the writer referred to other two species found at Natabua in 1941. These have now been determined by the Imperial Institute of Entomology as *Calandra linearis* Herbst. and *Martianus dermestoides* Chevr., both appearing to be secondary.

REFERENCES.

(1) Lever, R. J. A. W. 1941.—*Agric. Jour.*, Fiji, Vol. 12, No. 4, Decbr.
(2) Marshall, Sir Guy. 1931.—Insects of Samoa, Part IV, Fasc. 5.
(3) Zimmerman, E. C. 1941.—Proc. Hawn. Ent. Soc. XI, No. 1, July.
(5) Lever, R. J. A. W. 1942.—*Agric. Journ.* Fiji, Vol. 13, No. 1, March.

4. FURTHER REMARKS ON THE COMMON MOSQUITOES OF VITI LEVU.

During March some attention was given to the types of water in which the common mosquitoes breed and analyses of certain samples were carried out by the Senior Chemist. In order to make these results intelligible to the layman one can say, briefly and popularly, that a water is said to be neutral, i.e. neither acid nor alkaline, when its hydrogen ion concentration (represented by the symbols pH) has the value of 7. Larger values than 7 are alkaline and smaller ones acid, each whole number showing a tenfold increase on the ones immediately above or below it. Thus a water with a pH of 8 has 30 times the intensity of alkalinity than one with a hydrogen ion value of pH 5.

The common *Culex fatigans* Wied. was found breeding in pools heavily contaminated with molasses, the water being however almost neutral, pH 7·01. In another case the larvæ were collected in a grass-choked stream at Nadi and at Baniwai where the water was slightly more alkaline having a pH of 7·31. This agrees with its habits in Queensland where it normally breeds in waters ranging from pH 7·4 to 8·6(1), i.e. distinctly alkaline. Barrels, tubs, tins and trenches are also chosen for egg-laying. A new locality was seen in April when larvæ were taken in stone cooking pits, popularly called "ovens."

The much more specialized mosquito *Culex sitiens* Wied. was taken in water of exceptional acidity, viz. pH 2·05, in the form of partially evaporated pools of brackish water. Sea water contains approximately 2,000 parts of chlorine per 100,000 parts of water and as the sample under discussion had 1,510 parts of chlorine as sodium chloride in this volume of water it is clear how very brackish this sample was, in addition to being so acid. All stages of the insect were found at the same time in these pools which were close to the sea. The white abdominal bands of the adult are practically uniform in width, thereby differing from *Culex annulirostris*, see below.

Aëdes ægypti (L.)—is the well known dengue-spreading mosquito of the Pacific, notorious in other parts of the world as the vector of yellow fever. A thoroughly domestic breeder, it is the usual day-biting mosquito in Suva. The interesting point that males prefer to perch on clothes, curtains and nets while females rest on walls, doors or ceilings(2) was confirmed for Suva. Old tins, vases, receptacles for legs of meat safes and the basins normally kept under ice boxes to catch the melted ice are fruitful breeding places and should be looked to when this black and white mosquito becomes a pest. A careless neighbour can cause much trouble in this way by infesting surrounding houses with mosquitoes bred in his own compound.

Aëdes scutellaris Wlk. *pseudoscutellaris* Theob.—This long name is necessary to distinguish the common variety from the very similar forest-living form. Like the preceding it is a day-biter and can be distinguished from it by the possession of single unbroken white stripe down the centre of the thorax. During a few days spent bivouacing in the Naduruloulou and Tailevu areas in February this was the commonest and most persistent biter. Tins, bottles, drums, split coconut husks, tree rot-holes and such other artificial localities as old tyres, ornamental clams and lalis (native gongs) are favourite sites for breeding and trenches are also selected.

Aëdes vexans Meig. is found breeding chiefly in ground which has been puddled or pock-marked by cattle and also in slightly undulating ground and in trenches. Ploughing in such cases would be a more permanent control than filling in the depressions. As mentioned in the March issue(3), drains

and "fox holes" (shelter trenches for individual men) are also chosen for egg-laying. The specific name *vexans* is all too appropriate for this night-biting mosquito as will be confirmed by those who spent the later part of April under canvas in Ba. It can be separated from other mosquitoes by the nick in the middle of the abdominal white bands so that these are widest at the sides and not the middle and by possession of two small finger-like processes from the apex of the female abdomen. It also breeds in native "ovens."

Culex annulirostris Skuse.—Swamps, clear weedy streams, pools and rice fields besides barrels and ditches are the commonest sites for this night-biting mosquito. In April and May it was recovered from static water tanks. As the specific name shews it has a ring round the proboscis or rostrum but can be distinguished from *C. sitiens*, which also has this mark, by the pale abdominal bands being produced posteriorly in the centre. The siphon of the larva is so very long as to enable it to be readily recognized by the naked eye: if any confusion arose with *C. sitiens* the pointed anal gills would easily separate it as the latter has short, rounded ones.

The occurrence of two or more species of mosquito larvæ in the one water-place, a term coined by Marshall(4), is always interesting and the following are recent records:—

Aëdes ægypti and *A. scutellaris*,
Culex fatigans and *A. scutellaris* and
C. annulirostris and *C. fatigans*.

It is interesting to note in conclusion that during the height of the London "blitz" in the autumn of 1940 such ideal conditions of food and warmth were present in air-raid shelters that *Culex pipiens* L. *molestus* Forsk. was biting shelterers and also breeding underground at a temperature of 70°F. though it was freezing outside (5). This proves how very adaptable mosquitoes are to an environment which is favourable to them.

REFERENCES.

(1) Hamlyn-Harris, R. 1928—Proc. Roy. Soc. of Queensland, Vol. 40, No. 8, November 26.
(2) Shannon, R. C., Burke, A. W. and Davis, N. C. 1930—Amer. Jour. Trop. Med. Vol. 10, No. 2 March.
(3) Lever, R. J. A. W. 1942—*Agricultural Journal*, Vol. 14. No. 1.
(4) Marshall, J. F. 1922. *Science Progress*, January.
(5) Sinton, J. A. and Shute, P. G. 1940—Med. Memor. Ministry of Health. No. 238.

5. RECOGNITION OF MOSQUITOES.

Since the supplement to the *Fiji Times and Herald* of 7th April, a number of flies, believed to be malarial mosquitoes, have been forwarded from Suva and Levuka to the Entomologist. In order to allay any possible misapprehension the following additional facts are being supplied. Mosquitoes always have a biting proboscis from the front of the head, two transparent wings and, except for the large introduced *Megarhinus*, are not more than about a quarter of an inch in length. The spotted wings certainly serve to separate malarial from non-malarial mosquitoes but one must first ensure that the suspect is really a mosquito. If the possession of spots serves to distinguish a Dalmatian dog from a bull terrier one would not be justified in regarding a hyæna as a Dalmatian merely on the grounds that it is spotted as it is not a dog. Specimens will be welcomed by the Entomologist as it is better to be sure than sorry but a check up on the presence or absence of a probscis should eliminate the forwarding of daddy long legs and other non-biting flies.

—*Fiji Times and Herald*, 19th April, 1943.

6. SCALE INSECTS FROM FIJI INTERCEPTED IN THE UNITED STATES OF AMERICA AND HAWAII.

It is always a matter of interest to learn which of our insects are intercepted by quarantine departments abroad and the following gives details of local scale insects which have turned up in United States territory during a period of five years. It will be noticed that no pests were recorded in 1938.

Year.	Pest.	Host plant.	Where taken.
1937	*Lepidosaphes auriculata* ..	.. *Codiæum* sp. (croton).	.. Hawaii.
1939	*Odonaspis penicillata* ..	.. *Bambusa* sp. (bamboo).	.. Washington, D.C.
1940	*Leucaspis cockerelli* de Charm.	.. *Spathoglottis* (orchid) .	.. Hawaii.
1941	*Aspidiotus destructor* Sign.	.. Coconut	.. Florida and Hawaii.

Two of the host plants are flowering plants and the others probably curios, one of which reached the eastern States, doubtless in the belongings of a Matson Line passenger. The information is taken from the United States Department of Agriculture "List of Intercepted Plant Pests" for the years concerned. Data for 1942 have not yet been published.

Even such seemingly harmless objects as bunches of flowers are suspect as the "Graf Zeppelin" in her transatlantic flight of October 1928 was found to have aphids (green fly), coccids (scales and mealy bugs), other insects and a spider all from three bunches (roses, chrysanthemums and carnations) carried by lady passengers.

NOTES ON FIJIAN BUTTERFLIES.

By
Rev. E. G. BUCKNILL, M.A., F.R.E.S.

In Sir Edward Poulton's paper on mimicry in the butterflies of Fiji [1] there are, besides the mass of special material for which Sir Edward was largely indebted to Mr. H. W. Simmonds, O.B.E., many interesting letters and records recalling the two naval entomologists Paymaster Commander G. F. Mathew and Commander J. J. Walker as well as many concerning Mr. Simmonds himself.

In one such letter, dated 29th November, 1921, Mr. Simmonds deplores the scarcity of butterflies generally, especially on Viti Levu and particularly in Suva. It would be interesting to know whether Mr. Simmonds was still of the same experience and opinion when he left the Colony as within a week of landing on October 21st, 1942, the writer saw the following eight butterflies himself, all in Suva: *Danaida archippus* (*plexippus*), *Hypolimnas bolina*, *Euploea helcita eschscholtzi*, *Terias hecabe*, *Xois sesara*, *Zeuzera labradus*, *Telicota angustula*, and a battered Nymphaline, either *Melanitis leda* or *Doleschallia bisaltide*: the caterpillars of both of these last have since been taken in the town. Since then, on one day (unrecorded) a number of *Nacaduba vitiensis* were disporting themselves on legumes near the local fire station, while on February 10, a dying specimen of *Papilio schmeltzi* was carried into the Entomologist's office by one of his staff. It is possible that the war-time scarcity of labour for gardens may have induced a luxuriance of vegetation favourable to the maintenance of butterflies. On the other hand, in plantations on Taveuni and Ovalau for instance, the food plant of *D. archippus*, the false ipecachuana (*Asclepias curassavica*) is being smothered to-day by weeds of the baser sort. On December 16, 1922, Mr. Simmonds was writing as unhappily as in November 1921 of collecting in Suva; certainly at this moment (April 1943) there are more dragon-flies than butterflies on the wing in the capital. Is there a season for butterflies in the tropics? This scarcity, compared with six months ago, would suggest an affirmative answer and yet with their larvae it is apparently not so.

From the end of October 1942 until, say, mid April 1943, the writer has found in Suva nearly thirty eggs and three or four larvae of *Euploea helcita eschscholtzi*. The eggs are laid invariably on the terminal sprays of two kinds of *Allamanda*, *A. hendersonii* and *A. schottii* (the latter almost as common in Suva gardens), but the caterpillars eat only the maturer leaves of *Ficus barclayana*. This fig is not a garden bush but appears unexpectedly in hedges or by roadsides, the rockier the better, often in association with citrus but never with *Allamanda*. No egg has so far been found on the *Ficus* and no newly emerged caterpillar of *E. eschscholtzi* has either consented to eat or been found eating, after its initial meal of egg-shell, either species of the *Allamanda* except for a half-hearted nibble at petals. Further, no *Allamanda* leaf has been found with any trace of such eating which is obvious everywhere on those of the *Ficus*. Ants ascend the *Allamanda* for the sake of a secretion in the vacant calices of dropped flowers, but when confronted with young *Euploea* caterpillars on the march they display no interest whatsoever. The caterpillars have been found feeding readily on *Ficus* leaves in all stages, practically from second instar upwards. In captivity, they have to be transferred to suitable *Ficus* food with a camel hair brush.

Communications have been addressed to Mr. Simmonds in Australia and to another authority on Polynesian butterflies, Mr. G. H. E. Hopkins in East Africa. A local entomologist, Mr. W. Greenwood of Lautoka, preferred to suspend judgment until he has tried breeding the insect himself. Mr. R. J. A. W. Lever confirms that the butterflies raised from eggs laid on *Allamanda* and *Ficus*-reared caterpillars are identical. It may be added that the *Allamanda* species (there are several in Fiji besides the two mentioned) were introduced from South America whereas the *Ficus* is indigenous.

REFERENCE.

(1) Poulton, Edward B. 1924.—Trans. Ent. Soc. London, April 15.
Mimicry in the Butterflies of Fiji considered in relation to the Euploeine and Danaine Invasion of Polynesia and to the female forms of *Hypolimnas bolina* L. in the Pacific.

COPRA NOTES.

By C. HARVEY, B.Sc., A.I.C.T.A., Senior Agricultural Officer.

1. GRADING SUMMARY—1ST QUARTER, 1943.

Place.	Month.	Total number of bags presented for grading.	Number of bags.		Percentage.	
			Plantation.	F.M.S.	Plantation.	F.M.S.
Suva .. .. 1943.	January ..	1,772	1,355	417	76	24
	February ..	2,635	1,878	757	72	28
	March ..	3,513	2,109	1,404	60	40
	Total ..	7,920	5,342	2,578	67	33
Levuka .. 1943.	January ..	9,463	2,585	6,878	27	73
	February ..	16,597	3,094	13,503	19	81
	March ..	14,199	1,762	12,437	12	88
	Total ..	40,259	7,441	32,818	19	81
Savu Savu .. 1943.	January ..	349	104	245	30	70
	February ..	512	8	504	2	98
	March ..	572	....	572	..	100
	Total ..	1,433	112	1,321	8	92
Grand Total ..		49,612	12,895	36,717	26	74

There has been a constant deterioration in quality since the beginning of the year; the hurricane, spells of wet weather and labour conditions are variously responsible for this. At Savu Savu no space is now available for the separate storage of Plantation copra hence this is now either shipped to Levuka or mixed with and sold as F.M.S. grade. Much of the best copra is shipped to Suva for local manufacture into edible oil and soap and this accounts for the higher grading at Suva as compared with Levuka.

2. SHIPMENTS.

On p. 119 of Vol. 13, No. 4 of this *Journal* particulars were given of weights, costs and returns for the first five shipments of copra by the Fiji Copra Board. The following tables give like information in respect of five subsequent shipments.

It will be noted that the margin of realisation over cost has decreased, following the increase of 5s. per ton in price of copra given in June 1942, but still remains wider than was expected owing to the greater proportion of F.M.S. grade in the total export. The margin is wider in the case of F.M.S. grade; shipment No. 8 was largely F.M.S. grade while local sales for the manufacture of soap and edible oil were mainly of Plantation, hence the different margins between total cost and realisation.

TABLE 1.—PURCHASE WEIGHTS, SHIPPED WEIGHTS, AND SHRINKAGE.

Shipment Number.	Purchase Weights.		Shipped Weights.		Shrinkage per cent.	
	Plantation.	F.M.S.	Plantation.	F.M.S.	Plantation.	F.M.S.
Suva No. 6	1,790	912	1,742	888	2·7	2·6
Levuka No. 7.. ..	932	2,594	906	2,521	2·8	2·7
„ 8.. ..	610	1,734	599	1,714	1·9	1·1
Total ..	1,542	4,328	1,505	4,235	2·4	2·2
Total Shipped . ..	3,332	5,240	3,247	5,123	2·5	2·2
Local Sales *	508	56	500	55	1·6	1·8
Grand Total	3,840	5,296	3,747	5,178	2·4	2·2

* For local manufacture of soap and edible oil.

Total purchased, both grades .. .. 9,136 tons
Total shipped or sold locally, both grades .. 8,925 „
Overall shrinkage .. .. 2·3 per cent

TABLE 2.—COSTS AND RETURNS.

Shipment Number.	Purchase Cost.	Charges.		Total cost f.o.b.	Realization.	Surplus.	
		Total.	Per ton purchased.			Total.	Per ton purchased.
No. 6 ..	£42,318	£4,426	£1 12 7	£46,744	£47,856	£1,112	£0 8 2
No. 7 ..	53,832	5,954	1 13 9	59,777	62,027	2,250	0 12 9
No. 8 ..	35,766	3,568	1 10 5	39,334	41,784	2,450	1 0 11
Local sales .	8,971	705	1 8 6	9,676	9,896	220	0 7 10
Total ..	£140,878	£14,653	£1 12 1	£155,531	£161,563	£6,032	0 13 2

EXTRACTS.

1. RUBBER IN WARTIME.

DEVELOPING the production of crude rubber in areas outside Japanese control is being done in Ceylon, Africa, and South America. The United States is to receive all Brazil's exportable rubber up to the end of 1946, and is paying the high price of 39 cents a lb f.o.b. Belem to bring it out—the cost of production on Malayan plantations was about 11 cents a lb. But rubber trees cannot be grown overnight, and the highest estimate of the annual amount obtainable from Latin America in the near future is 42,000 tons.

An allied development is the growth of the guayule shrub, which yields appreciable quantities of rubber after four years. It is native to Mexico, and has spread in a wild state to Texas, Arizona, and New Mexico. But this also holds out no hope for the immediate future.

EUROPE'S ALTERNATIVES.

In the last resort the United Nations must depend on the production of synthetic rubber or rubber substitutes. In this respect they will only be doing what Germany has had to do. In 1920 a synthetic rubber known as buna was discovered in Germany. The first large-scale plant for its manufacture was completed in 1939, and another was being built when war was declared. The Soviet Union has also been producing a synthetic rubber of the buna type from agricultural alcohol.

The United Kingdom agreed that the synthetic rubber industry should be concentrated in the United States. Four plants were authorized, and after Pearl Harbour the programme was increased to 350,000 tons in 1943 and 700,000 tons in 1944. Of this the great bulk will be buna, with small quantities of butyl and neoprene.

—Ivor Thomas in *Observer*, Oct. 1942.

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2. BRITISH AGRICULTURE.

GRAIN acreage has increased, roughly speaking, from the pre-war figure of five million to the present total of nine; home-grown wheat used for milling has been more than doubled. Potatoes have risen from five to eight million tons; vegetables from three to four-and-a-half; the milk yield has been ten million gallons above pre-war, and thirteen millions more than last year; most spectacular of all, perhaps, to the layman, England has herself produced more than the whole domestic ration of sugar. That, of course, does not cover the whole sugar consumption of the country, and in giving such figures it is as well to strike a note of caution; war-time food economy, however successful, involves efforts by consumer as well as by producer. Still, no one in this country needs now to be reminded that the strain on our shipping, combined with the reverses in Egypt and the Caucasus, makes this war more than ever a neck-to-neck race of resources.

—*Observer* (London), 2nd August, 1942.

3. ALLIED CO-OPERATION IN WEST AFRICA ON ANTI-MALARIAL PROBLEM.

"SPECIAL attention has been given to this matter since the outbreak of war, and a mission was sent out to investigate and advise on the measures to be taken against the incidence of malaria in Freetown. The measures recommended are being implemented as far as possible, with funds provided under the Colonial Development and Welfare Act. There is the closest co-ordination between the civil administrations and the Services, including the U.S.A. authorities, and an officer of the Colonial Medical Service visits all seaports in British West Africa to advise on the co-ordination of the measures which are being taken. The R.A.F. have their own specialist officer to deal with the problem, and an experienced entomologist seconded from the Colonial Medical Service has recently been visiting all airfields in British Africa. (19th November, 1942.)"

—Reply to question in House of Commons. *Crown Colonist*, January 1943.

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4. MEDICINE FOR PLANTS.

By
HUGH NICOL,
Imperial Bureau of Soil Science, Herpenden, Herts, England.

SINCE the last world war a great deal has been learnt about vitamins and other accessory food factors for man, and some of this knowledge has become common property. It is not so generally known that plants suffer severely when they are unable to obtain the minute amounts of some materials which they require. Just as the knowledge of human nutrition that was available a generation ago was insufficient, so has the knowledge about the manuring of plants expanded considerably since the days when nitrogen, phosphate and potash were thought to be the most essential plant foods.

So many chemical elements are now known to be needed by plants that we can no longer say that one rather than another is essential. Lucerne, for example, becomes yellow, grows badly, and is poor food for animals unless it is supplied with small quantities of the element boron. If boron is absent from the soil, ordinary manuring will not make good the deficiency, and borax or boric acid has to be supplied as well. Vegetables such as tomatoes and celery also suffer from the absence of boron, and become unacceptable to the consumer.

Substances previously thought to be merely poisonous to plants are now known to be essential. These include copper and zinc. The amounts of these two elements that are required for healthy plant growth are so exceedingly small that most soils supply enough, and even a small dose tried experimentally is likely to show only the poisonous effects. In Australia there are, however, soils largely composed of old sea land (largely calcium carbonate) on which cereals will not form grain unless copper sulphate is supplied. The amount taken up by the cereal plants is no more than a few grams per hectare. Cereals require this almost infinitesimally small amount to complete the development of their reproductive organs, namely, to form grain; and if copper is not supplied naturally by the soil or artificially as a manure there will be a crop of straw but no grain. Because of the small amounts required, plant nutrients such as boron, copper, zinc and manganese are often called "trace" or "minor" elements.

It is not possible to investigate the unknown unless some clue is supplied. The discovery of plant requirements for minute traces of elements has sometimes been due to chance.

The discovery that pecan trees need zinc if they are to crop well was due to an accident. In 1932 it was known that certain peaty soils in Florida on which the pecans were growing were lacking in copper, and solutions of copper sulphate were prepared to apply to the trees. It was expected that some improvement would be noticed in the growth of all the trees treated with copper. But, although some trees responded, others that had also been treated remained backward in growth. No explanation could be found until an enquiry was instituted into every detail of the experiment.

Solutions of copper compounds should always be made up in wooden or copper vessels, because they attack many metals. Some of the solutions intended for the pecan trees had been correctly made in wooden buckets, but some of the workers had been careless, or ignorant of chemistry, and had used galvanized buckets. It was the trees treated with the solutions wrongly made in the galvanized buckets that had responded! This was due to the fact that the copper solutions had dissolved away part of the zinc lining, and the effect on the trees was due to the zinc—not to the copper.

An interesting action of trace elements is to give protection against frost. Peach trees given a manurial mixture which included small amounts of borax, manganese sulphate and zinc sulphate as well as nitrogen, phosphate and potash in ordinary amounts, suffered much less from frost damage to their leaves than did similar trees receiving only the usual manures. This is an example of the influence of nutrition upon condition.

5. ROTHAMSTED EXPERIMENT STATION.

The Rothamsted Agricultural Experiment Station in England which is the oldest agricultural institute in the world will celebrate its centenary in 1943. Rothamsted has expanded remarkably in its research activities in the last few decades and its authority in agricultural matters, particularly in regard to soils, is unique. Sir John Russell who has been Director for 31 years will shortly be retiring. His untiring enthusiasm and energy have been a great asset to the station and the retirement of such a brilliant director will be much regretted. —H.W.J.

REVIEWS.

1. COLONIAL ADVISORY COUNCIL OF AGRICULTURE AND ANIMAL HEALTH (1).

The minutes of the fiftieth meeting of the above Council have recently come to hand and it is considered that a brief synopsis may prove of interest as indicating the wide scope of the activities embraced by the Council.

A survey of agricultural marketing in the Colonial Empire was prepared by Dr. Tempany, Agricultural Adviser to the Secretary of State and is likely to prove extremely useful to agricultural workers in the Colonies.

A report on the occurrence of *Cercospora musæ* or leaf spot disease of bananas in the French Cameroons was discussed at length, information indicating that the disease was becoming more virulent and widespread and proving a serious threat to the industry in the Cameroons. It was intimated that costly control measures, similar to those now used in Central America, would have to be adopted and that it was likely that the disease would spread to adjoining territories. It was further suggested that the relative susceptibility of different varieties of bananas should be investigated when practicable.

A report was also circulated to the Committee dealing with banana leaf spot control in Jamaica.

The need was stressed for a control bureau where advice on statistical methods and the lay out of experiments could be obtained by agricultural workers. At present such work was carried out at Rothamsted and this would be continued until the end of the war.

The Committee viewed with concern the fact that swollen shoot disease of cocoa in the Gold Coast could not be be effectively controlled in the main growing areas and agreed that further research on this disease was vitally necessary and should be undertaken without delay.

Mr. J. Cadbury's interesting memorandum on the "Future supplies of Cocoa" was discussed and it was agreed that an early survey should be made of areas in the Colonial Dependencies which appeared to be suitable for the growing of cocoa and that all available information should be supplied by Directors of Agriculture. (There are suitable areas in Fiji.)

A report on the working of the Colonial Agricultural and Veterinary Schemes was considered. It was suggested that provision in the future should be made for plant physiologists to conduct investigations in certain kinds of crop failure. The report recommended the annual recruitment of twenty-three agricultural and nine veterinary scholars for the next five years and that the whole of the cost of the scheme should be met from Colonial development and welfare funds. It was stated that only eight failures were recorded out of a total of 256 scholars trained for the Colonies and this result was deemed highly satisfactory.

The consideration of a memorandum on agricultural education officers represented an attempt to meet the demand for officers who would be available for training agricultural assistants and elementary school teachers in agriculture and agricultural science. The opinion was expressed that such training could possibly be given by officers already in the service who had local experience which is valuable in educational work. It was strongly stressed that the idea which appeared to persist in some places that a man who had a university degree in agriculture thereby ceased to have a practical outlook in agriculture must be corrected. The Council was emphatically of opinion that this view was retrograde and totally at variance with the facts. In fact, one of the most striking advances which had occurred in recent years was the demonstration that a good agricultural scientist was also a good practical farmer.

Soil erosion in the Colonial Empire was the subject of another report under discussion. Attention was drawn to the good progress made in Uganda and Nigeria and to the value of the brief annual reports now submitted by the Colonies during war time.

Another subject that the Council discussed was the general policy towards agricultural education in the West Indies and the greater use of Hope Agricultural College, Jamaica and the Imperial College of Tropical Agriculture in Trinidad was recommended.

The cocoa research programme of the Imperial College of Tropical Agriculture was discussed and the need of growing, in new areas of production, a type suitable for bulk consumption was stressed. Also the necessity for maintaining quality while endeavouring to raise yields and of gaining a reduction in production costs were emphasized.

The importance of the role of food in post war reconstruction and its bearing on agricultural policy was also discussed. It was agreed that food policy should be based on human needs and the possibilities of satisfying them rather than on the needs of the trade.

Other subjects under discussion by the Council included, the question of centralized animal health research in East Africa, the report of the " Low Temperature Research Sub-Committee ", investigations on difficult weeds and termites, agricultural publications and food production in the Colonies.

The Council is formed of eminent men of long experience in various agricultural and veterinary pursuits and hence their deliberations carry considerable weight. —H.W.J.

COLONIAL ADVISORY COUNCIL OF AGRICULTURE AND ANIMAL HEALTH (2).

MINUTES of the fifty-fourth Meeting of the above Council largely refer to agricultural developments in the West Indies and should be of interest.

At this meeting Sir Frank Stockdale, Comptroller of Development and Welfare in the West Indies, was present and spoke at length on his work. He said that " every endeavour had been made to impress upon the people of the West Indies, both officials and unofficials, and both large estate proprietors and peasant agriculturalists, that agriculture in these islands should be looked upon as a means of livelihood and a mode of life. Consequently considerable emphasis had been placed on welfare of the rural people."

The first objective was the conservation of natural resources, the cessation of soil exploitation and soil erosion and reafforestation. He said that much good was being done by placing stones and rocks along contours, planting of grass and hedges and strip cropping.

Another objective was the establishment of a more permanent form of agriculture and in this connexion both large and small scale mixed farming was being stressed with a view to the maintenance of soil fertility, the development of a pride in their lands by the people and the inculcation of the knowledge that the land was the surest means of providing them with a sound livelihood.

He said that the evils of the freehold system of land tenure were being increasingly realised as well as the advantages of leasehold tenure for the proper maintenance of the condition of land. Share cropping was also, he said, degrading for the cropper, the owner and the land,

Another objective was the building up of a reasonable standard of living and of nutrition for rural people and to do away with the great disparity that still exists between urban and rural standards. It was difficult to improve the general standard of morals in the absence of decent homes and the respect they engender.

Sir Frank said that the general agricultural policy turned upon the establishment of mixed farming. Goats, pigs and poultry should be the starting point for small peasant farmers with milk for the family and surplus butter being converted into ghee as a means of providing cash income for the farmer.

He stressed the advantages of stud centres from which improvement of stock could be secured and the use of silage in the dry zones to cheapen the cost of milk.

In regard to agricultural education, he said that the three R's should be compulsory up to the age of 12 and thereafter education should be on a voluntary basis and confined to handicrafts, housecrafts and husbandry.

He stressed the great value of fisheries and the need for their improvement and regularization and maintained that while carbohydrate food was adequate, protein foods could be more economically obtained from animal sources than from pulse crops which gave small yields.

In regard to marketing of produce Sir Frank said that it was felt that the middle man always claimed too big a share of the crop return from the sale of produce and in consequence the peasant had always to accept a lower remuneration than his services justified. —H.W.J.

2. MILITARY FOOD SUPPLIES IN EAST AFRICA, 1915–1918.

CERTAIN paragraphs which seem of topical interest are reproduced below from General (then Colonel) von Lettow-Vorbeck's account of his East African campaign. To have kept a force of fighting men in the field for four years, against odds which he states to have been twenty to one, is no mean feat and Lettow-Vorbeck's remarks about native crops are of more than ordinary value at the present time. For a senior military officer to take an intelligent interest in fungi certainly calls for comment.

" It was evident that, as the war seemed likely to be prolonged, the stocks in the Colony [Tanganyika] would become exhausted. The natives at New Moshi began all of a sudden to wear silk: this was by no means a sign of special extravagance: the stocks of cotton clothing in the Indian shops were simply coming to an end. We had seriously to think of starting manufactures ourselves, in order to convert the abundant raw material into finished products. A curious existence now developed, reminding one of the industry of the Swiss family Robinson. Cotton fields existed in plenty. Popular books were hunted up, giving information about the forgotten arts of hand spinning and weaving; white and black women took to spinning by hand; at the missions and in private workshops spinning-wheels and looms were built. In this manner, in a short time, the first useful price of cotton cloth was produced. After various trials, the most suitable dye was obtained from the root of a tree called Ndaa, which imparted a brownish-yellow colour, very inconspicuous both in the grass and in the bush, and therefore specially suitable for uniforms. The rubber gathered by the planters was vulcanised with sulphur, and we succeeded in producing efficient tyres for motors and bicycles. At Morogoro a few planters successfully produced a motor-fuel from *Cocos*, known as trebol, which was like benzol, and was employed in the automobiles. As in former times, candles were made out of tallow and wax, both by private persons and by the troops, and also soap. Then again, the numerous factories on the plantations in the northern territories and on the Tanganyika Railway were adapted to produce various means of subsistence.

"A particularly important item was the provision of foot-wear. The raw material was obtained from the plentiful skins of cattle and game; tanning materials from the mangroves on the coast. In peace time the missions had already made good boots; their activity was now further developed, while the troops also established tanneries and shoemakers' shops on a larger scale. It is true some little time elapsed before the authorities complied with the urgent and inevitable demands of the troops in an adequate manner, and, in particular, before they placed at our disposal the buffalo-hides necessary for making sole-leather.

" I spent the night in his (Capt. Tagel's) camp, and he set before me an excellent dish of young maize prepared like asparagus. This led us to speak of the maize fields of Mpanganya and the neighbourhood. These were full

of women and other natives who had swarmed over them like a flock of birds, and were living on the young, unripe corn. This was as bad economy as well could be, but it gave me the idea that in case of need the maize crops could be largely used before they were ripe. This need very soon occurred, and an experiment with the ears which had ripened most showed that these could be artificially dried and a very good meal made from them. After this, the ripest ears were gathered daily, and as the whole crop ripened the food situation improved from day to day. By the 1st March it was found possible to increase the ration to seven hundred grammes, or nearly the normal allowance.

" The increasing severity of the whole campaign called for a more intensive and energetic exploitation of our food resources; the slow, deliberate supply methods of the civil authorities, which had sufficed for the first phase of the campaign, were no longer adequate.

" We had long ago learned to make excellent spinach from different foliage plants (called Mlenda); now they showed me many different kinds of excellent wild fruit. We also learnt that the kernel of the Mbinji-fruit, the pulp of which I already knew contains prussic acid, is quite free from acid, and when roasted makes an exceptionally delicate dish, tasting like our hazel-nut.

" Many species of this mango fruit, known to the natives as Embeh, were to be found in the station and the neighbouring native villages. It was already begining to ripen and was so plentiful that it was found worth while to have the fruit systematically gathered. The waste to which the natives are generally prone was prevented as far as possible. The beautiful, sweet fruit was enjoyed by all the Europeans and a great part of the natives and, in view of the shortage of sugar, for weeks provided a really valuable addition to the supplies.

" Welcome as the manna to the children of Israel, the fungi which shoot up at this season helped to keep us from starvation. I had already in Germany interested myself in mycology, and soon found fungi closely related to our German species of mushrooms and yellow boleta and others, in the African bush. I had often gathered basketfuls in a very short time, and even though an excessive diet of mushrooms is indigestible and not very sustaining, they were a considerable help."

"My Reminiscences of East Africa" by General von Lettow-Vorbeck. Hurst and Blackett, London. No date. —R.J.A.W.L.

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3. RELATIVE NUTRITIVE VALUE OF DIFFERENT FORMS OF MILK.

A brief account of the relative nutritive properties of milk in its different forms may be timely.

It should be realized at the outset that from the point of view of nutritive value, milk is variable food. Though its " major " constituents, protein, fat, carbohydrate and ash, change but little throughout the year, some of its vitamins are subject to marked fluctuations according to the season and the nutrition of the cow.

The importance of milk in human nutrition rests primarily on its content of first-class animal protein of high biological value, its exceptional richness in calcium, and its valuable contribution of vitamin A and of riboflavin and other water-soluble vitamins. The unique value of milk for children, adolescents, pregnant and lactating women is now universally recognized.

With the development of our knowledge of vitamins and of methods for their accurate estimation much work has been done on the effects of commercial processing on the food value of milk, and it may be said broadly that these have proved much less drastic than was formerly believed.

Of the milk constituents, the proteins and certain vitamins are most liable to heat injury and the extent to which this takes place can best be judged by taking raw fresh milk as a base line. The proteins of milk consist of casein, lactalbumin and lactoglobulin, which are almost completely digestible, and have a high biological value, that is, they can be efficiently utilized to build or replace body protein. As judged by animal experiments, this efficiency may reach some 90 per cent for raw milk.

Regarding the so-called " minor " (on a weight basis) constituents, milk is a rich source of vitamin A which is partly present as the provitamin, B-carotene. It is well known that milk produced on pasture is much yellower and also contains more vitamin A than milk of stall-fed cows. Vitamin D, of which there is little in milk, varies with the season, but normally it depends not on the feed, but on the direct action of the sun on the cow. Of the water-soluble vitamins riboflavin is richly represented in milk.

The vitamin C content of milk varies but little throughout the year, and is independent of the feed of the cow. The amount present in milk as it leaves the udder is appreciable, 2·0–2·5 mgm. (40–50 I.U.) per 100 ml; one pint of such milk would supply one-quarter to one-third of the daily requirements of a child. Vitamin C is, however, easily destroyed in milk by exposure to light; it is at first converted into a labile form, dehydroascorbic acid, which in turn decomposes spontaneously or under the action of heat. For this reason commercial milk generally contains only a fraction of the vitamin C originally present. In any event, care should be exercised not to expose bottled milk unnecessarily to bright light.

The level of vitamin B 1 in milk is also independent of the feed, and remains constant during the year at about 12–15 I.U. per 100 ml.

Several other vitamins belonging to the vitamin B complex are also present in milk Some of them, like nicotinic acid and vitamin B 6 are heat-stable, and are not likely to be effected by processing; the fate of others has not yet been sufficiently studied.

Milk should not be consumed raw unless it is established that it is bacteriologically safe. Rapidly brought to the boil to ensure freedom from infection, it losses little or nothing of its nutritive properties. A large part of the commercial supply of milk in Great Britain is now pasteurized by the holder method. It has been satisfactorily established that the only nutritive effects of this treatment are a loss of some 20 per cent in the vitamin C content (and this is due, rather, to previous exposure to light than to heating in the course of pasteurization), and a 10 per cent decrease in the vitamin B 1 value.

The stable, concentrated forms of milk are, broadly speaking, prepared in three different ways. The moisture may be removed as completely as possible, giving dried milk powder; or it is only partly removed, and the condensed milk is either sterilized by heat treatment to ensure bacteriological purity or enough sugar is added in the process of manufacture to inhibit bacterial growth. All three methods in various modifications are applied to separated as well as to full-cream milk.

Most of the " major " and some of the important " minor " constituents of milk are relatively stable, and these are not effected by the various commercial processses. Thus, vitamin A and carotene, vitamin D and riboflavin survive the various methods of preservation of milk without appreciable loss.

The effects of these treatments by modern methods are generally quite mild as may be seen in the attached table:—

COMPOSITION OF DIFFERENT FORMS OF MILK.[1]

Form of Milk.	Calories per 100 gm.	Grams per 100 gm.					Vitamin A 2 activity.		Vitamin D 2		Vitamin B 1		Riboflavin [2]		Vitamin C 3	
		Water.	Protein (N.x 6·38)	Fat.	Carbohydrate	Calcium.	I.U. per 100 gm.	Loss in manufacture.	I.U. per 100 gm.	Loss in manufacture.	I.U. per 100 gm.	Loss in manufacture.	Mgm. per 100 gm.	Loss in manufacture.	Mgm. per 100 gm.	Loss in manufacture.
												%				%
Raw	66	87·6	3·3	3·6	4·7	0·120	70–200	..	0·5–3·0	..	12	..	0·1–0·2	..	0–2·5	..
Pasteurized	66	87·6	3·3	3·6	4·7	0·120	70–200	none	0·5–3·0	none	11	10	0·1–0·2	none	0–2·0	20
Sterilized	66	87·6	3·3	3·6	4·7	0·120	70–200	,,	0·5–3·0	,,	8	30	0·1–0·2	,,	0–1·2	50
Spray dried whole[5] ..	12	3·0	23·0	27·5	37·5	0·910	550–1600	,,	3·9–23	,,	85	10	0·8–1·6	,,	0–16	20
Roller dried whole[5] ..	12	3·0	25·0	27·5	37·5	0·910	550–1600	,,	3·9–23	,,	80	15	0·8–1·6	,,	0–13	30
	..	4·0	36·0	0·5	50·0	1·250	trace	most	none	all	115	10	1·2–2·4	,,	0–20	30
Dried skim[4]	169	68·5	8·4	9·2	12·0	0·300	180–500	none	1·3–7·6	none	18	40	0·25–0·5	,,	0–2·5	60
Condensed whole unsweetened (evaporated)[5]	144	73·0	7·0	8·0	10·0	0·260	150–430	,,	1·1–6·5	,,	16	40	0·22–0·44	,,	0–2·2	60
Condensed whole sweetened	344	25·0	8·8	9·5	53·5	0·325	190–530	,,	1·4–8·1	,,	29	10	0·27–0·54	,,	0- 5·7	15

[1] The composition varies from sample to sample; the figures given in the table may be taken as representative.
[2] Varies according to size.
[3] Varies according to the handling of the liquid milk.
[4] Product hitherto made in Great Britain in accordance with 1923 Condensed Milk Regulations.
[5] Suggested composition for product manufactured in accordance with the recently reduced standards (Condensed Milk Order, 1940) and corresponding with U.S.A. Standards.—Dr. S. K. Kon in *Nature*, 22nd November, 1941.

—H.W.J.

4. DISEASES OF ANIMALS—PREVENTION AND TREATMENT.

1. Introduction.

War conditions make it essential to preserve those classes of stock most valuable for food production. Of these, the dairy cow is most important and must receive preferential treatment in the rationing of feeding stuffs. One of the most important factors determining the economic value of animals is health and it is proposed here to discuss various diseases of cattle and their methods of control. The National Veterinary Medical Association considers that of these diseases, contagious abortion, mastitis, tuberculosis and sterility are of major importance. Our methods of control are incomplete, but recent research work will enable us to alleviate the situation to a marked extent.

2. Contagious Abortion.

This is due to the micro-organism *Brucella abortus*. It causes losses in both calves and milk yields and by infection of the genital tract leads to temporary infertility, if not permanent sterility. There are two methods of control, (*a*) the "blood" (agglutination) test and (*b*) vaccination.

(*a*) Positive reactors are removed from contact with clean stock. All fresh introductions are tested before admission to the clean herd. This method is difficult because of the constant danger of reinfection and in America it is stated by Cotton that it is not always practical and that we require a method which is less expensive and more workable.

(*b*) British results of vaccination of non-pregnant stock with a living *Brucella abortus* vaccine have been successful. Use of vaccine in which the micro-organisms have been killed are not successful either after a long or short course of treatment.

Instead of using virulent *Brucella abortus* vaccine, a strain produced by frequent passage through guinea-pigs has been used by McEwen in England. By inoculation through a succession of guinea-pigs, one to another, a strain was produced which was low in actual virulence but retained very high immunizing properties. This used on pregnant and non-pregnant heifers protected them against severe exposure to infection with a fully virulent strain. McEwen considers therefore that this vaccine could be used on herds free from infection to prevent spread of the disease and particularly in cases where "blood" testing and isolation are impracticable. This vaccine does not cause a positive reaction to the "blood" test when this test is subsequently carried out.

In America another strain of *Brucella abortus* has been used for vaccination, the vaccination being carried out during calfhood instead of at adult age. Calves vaccinated show a positive result to the "blood" test for some time after vaccination. Of 13,845 calves vaccinated in one experiment, 8,182 have since had three preganancies and 96·2 per cent of the calvings were normal. As a result of this and similar experiments it has now been decided to use calfhood vaccination as a method of control in addition to "blood" tests and slaughter of reactors, or preferably a combination of both these methods.

The N.V.M. Association, on considering all evidence are now recommending that "blood" testing should be continued, that vaccination be encouraged in badly infected herds, and that, circumstance permitting, calfhood (4 to 8 months of age) vaccination should be carried out, the young heifers being separated from the main herd till after calving.

3. Mastitis.

The N.V.M. Association considers four cases of this disease, *Streptococcus agalactiæ*, *Staphylococci*, *Corynebacterium pyogenes* and *Streptococci* other than *agalactiæ*. *St. agalactiæ* is responsible for 80 per cent to 90 per cent of all mastitis. In many acute cases, however, it is impossible to identify the causal organism. Australian workers have found that it is impossible to reproduce streptococcic mastitis in the absence of preliminary damage by other infection to the tissues of the udder. Control by segregation of cows found on test to be infected in the udder is not always possible because it is now known that the micro-organisms can live in other organs of the body.

In the treatment, drugs of the sulphonamide group have been found effective in serious and acute clinical cases, at least 60 per cent and, in some herds up to 90 per cent clinical cures being obtained in many cases. Drugs of the acridine series have also been found effective. The common house fly (*Musca domestica*) has a marked effect on the spread of this disease. The flies feed at the tip of the teat of lactating cows and insert their proboscis deep into the fossa of the teat. In this way infection is spread from cow to cow. It is recommended that all dairy cows be examined quarterly by a veterinarian to facilitate early detection and subsequent treatment and control.

4. Tuberculosis of Cattle.

Eradication of tuberculosis is based on recognition of affected animals by clinical examination or a tuberculin test. Observations in Australia on the tuberculin test using the single intradermal method in the caudal fold, indicated a high degree of accuracy. Emphasis is laid on the value of reading the test at the 96th as well as the 72nd hour. It is also pointed out that negative reactors usually show no swelling whatever, i.e. doubtful reactors are very seldom seen.

Opinion is divided regarding the influence of infection with *Brucella abortus* on the tuberculin reaction. It is said by some that presence of *Brucella abortus* will cause a false positive tuberculin reaction. Others have failed to support this.

Infection with avian tuberculosis sensitizes cattle to mammalian tuberculin (the type of tuberculin used in tuberculin testing in Fiji). Consequently even though bovine tuberculosis may be eradicated, cattle would still react to the tuberculin test until avian tuberculosis could be also eradicated (avian tuberculosis is very rare in Fiji). A vaccine called the " B.C.G." has been used to some extent in the past. A new type of vaccine, produced from an acid fast micro-organism isolated from the vole has given a protection far greater than that recorded by other means. Authors have stated that the results from this have been unexpectedly good and better than that produced with the " B.C.G." type.

5. Sterility.

This is responsible for a large amount of economic loss. In some cases 25 per cent of all dairy cow disposals were due to sterility. Suitable control, however, will prevent 80 per cent of this loss, because in most cases the condition is not " absolute sterility " but " relative infertility " which will respond to suitable treatment. This is particularly so in the case of sterility brought about by *Brucella abortus* (in which case by the time sterility is diagnosed the organism has disappeared from the uterus). Infection by *Brucella abortus*, *Trichomonas fœtus*, *Corynebacteria* or viruses, of any part of the genital tract will respond well to early treatment, except

when the fallopian tubes and ovary are simultaneously inflamed in which case treatment is not often successful.

Physiological derangement is another common cause of sterility. Young cattle kept on a low plane of nutrition will often suffer from this type, or under certain conditions the signs of œstrus may be so slight as to pass unnoticed—the so-called "silent heat". In such cases, if the cow is run with the bull breeding will result. The importance of the bull in dealing with this condition must not be overlooked.

There seems little doubt that many affected cows can be cured of sterility by appropriate and early treatment. It is essential, however, that examination be carried out only by a skilled person. Moreover, the application of treatment is a skilled operation often requiring the use of instruments by those experienced in the various techniques. Therefore it is recommended that the stock owner keep accurate herd records and that a veterinarian examine these as well as the cattle periodically so that early, and effective treatment can be carried out.

6. Phenothiazine.

(A new drug for use against intestinal parasites).

Although most animals harbour intestinal parasites to a greater or less extent, these, especially in adults, are tolerated and no great inconvenience is caused. In fact, it may be said that the presence of a small number of the various types is an advantage as in this way resistance to later heavy infestation is developed. Most worm parasites are "Type specific" i.e. a particular worm will only infest one type of animal.

For some years round worm infestation of ruminants has been treated by drenching with a copper sulphate-nicotine sulphate mixture (this treatment has been found very useful in the treatment of calves in Fiji). Recently, however, a chemical compound, phenothiazine, has been found highly effective against some types of round worm. Workers in England, Australia, America and Canada have used this and some reports state that 100 per cent of the round worms have been removed from the fourth stomach of sheep and 80 per cent from the small intestine. No harmful results have ever been seen in sheep and it is reasonable to assume that the same applies to cattle, but in the case of cattle it seems probable that the drug will prove less useful than in other ruminants. In horses the drug was found to be 100 per cent effective against red worms. —H.T.B.H.

—*Journal of Royal Agricultural Society of England*, Vol. 102, 1941.

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5. MALARIAL ISLANDS OF MELANESIA.

In a paper (1) reviewed in the *Review of Applied Entomology* for December last (Vol. 30, Series B, Part 12) there occurs a remark about the occurrence of malarial mosquitoes and malaria in New Caledonia. Mr. Mumford states that *Anopheles punctulatus* Dön. has been recorded there by some workers while others deny its presence in New Caledonia. On the whole it seems more desirable to wait for definite confirmation of its presence there before publishing anything suggesting that it may be present.

It is interesting to note that the author considers it not unlikely that New Caledonia, Hawaii and the islands of the Central Pacific, presumably including Fiji and Samoa, will cease to be free from malaria before the end of the war.

(1) Mumford, E. P.—1942. *Science*, Vol. 96, No. 2, 487. —R.J.A.W.L.

6. AMERICAN AGRICULTURAL PRODUCTION GOALS.

AN article in the *New York Times* of March 21, 1943, sets out production goals in the United States of America. These include increases of 9 per cent for corn (maize), 26 per cent for rice, 9 per cent for potatoes, 33 per cent for beef and veal, 61 per cent for pork, 13 per cent for milk, 34 per cent for eggs, and 183 per cent for soy beans, with decreases of 24 per cent for wheat, 29 per cent for edible beans and 15 per cent for cotton

The increase in production of soy bean related to the scarcity of copra since Japan occupied Eastern and Pacific copra-producing territories and may place the soy bean industry in a strong position in the post-war oil market —C.H.

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7. POST-WAR DANGERS.

Sir Alan Pim said he would outline some possible post-war dangers judged by the experience of the last war and then would discuss some aspects of development under the new conditions.

Two important factors were, first that all colonizing nations would in future have to work together more closely than hitherto; and second, that we would have to adjust ourselves to our new position as a debtor instead of a creditor nation.

In future, both trade and capital investment would be more subject to Government control than before. Exchange control and commodity control schemes had come to stay, though more attention must be paid to the needs of consumers.

Most Colonial territories had now passed the initial stages of development. Their external trade had been developed but was concentrated on a small number of products. Their internal trade was small, little capital had been accumulated, and little secondary industry. A good deal could be done by encouraging small industries and internal trade. Markets were the main determining factor, and special circumstances, such as scarcity of outside supplies during the war, might help to create a market for Colonial industries.

In the past progress had mainly depended on the introduction of European capital and on European needs. The alignment of railways had depended on the presence of minerals. Mining and commerce alone had been able to obtain equity capital. Much more capital, with very little interest return, would be needed in future. How was this capital to be obtained and applied after the war?

There had been many projects put forward for applying capital to Africa on a grand scale, particularly in Central Europe. But these schemes had been based on European interests, and on the idea of European settlement. Dr. Schacht had put forward a scheme for international chartered companies for Colonial development. Such companies, independent of local administrations, would become too powerful and impede progress towards local self-government. They would also have difficulty in raising capital. Capital application must be better controlled in future to avoid waste, and expenditure must be planned internationally to cut across political boundaries.

It was not easy to determine what the best future organization of mining should be, but a fair share of profits must be retained by local administrations, and there was much to learn from the taxation of the gold mines in the Union of South Africa. The future of agriculture was also doubtful, because it was

not an economic proposition. For the natives, peasant cultivation might have to be supplemented by plantation methods, run by the natives themselves. Most important for the agricultural future was the settlement of the question of land tenure.

But the most important problem was the development of the capacities of native peoples so that they would be able to take advantage of science and new economic opportunities. In the past, African development had depended on the use of Africans as great masses of undifferentiated labour. Those days of undifferentiated labour had gone.

In internal trade, the African had developed little. In East Africa the Indian had monopolized retail trade, and in West Africa the Syrian was predominant. Africans now wanted to expand, but were hampered by these vested interests. The African had practically no share in the import or export trade—it was monopolized in West Africa by the United Africa Company and the small African share was actually decreasing. Co-operative organization had been recommended to combat this position, but this might or might not be workable. —H.W.J.

—*Crown Colonist*, November, 1941.

MR. P. L. R. CHARLTON.

CONGRATULATIONS and good wishes are extended to the Chemist, Assistant Government Analyst and Assayer, Mr. P. L. R. Charlton, who has been fortunate enough to be the second member of the Department to receive release for active service overseas. Mr. Charlton holds the rank of Lieutenant in the Signals Section, First Battalion, Fiji Infantry Regiment, and is now at an advanced island base in the Pacific war zone.

SUVA RAINFALL, 1942.

January	1·71	May	9·24	September ..	7·75
February . ..	8·87	June	8·53	October ..	6·32
March	6·72	July	3·99	November ..	1·78
April	24·82	August ..	5·52	December ..	8·81
				Total ..	93·83

The rainfall was 27·03 inches less than the average for the last 56 years due to November and December having only 10·59 inches together in place of the average 23·03 for these two months. The figure for April was almost twice the average of 12·90 inches. —R.J.A.W.L.